

# OBJECT-DRAG CONTINUITY BETWEEN DISCONTINUOUS TOUCH SCREENS OF A SINGLE VIRTUAL DESKTOP

## FIELD OF THE INVENTION

The present invention relates to apparatus and process for manipulating displayed objects between touch screens where there is a physical discontinuity between the touch screens.

## BACKGROUND OF THE INVENTION

Personal Digital Assistants (PDA) are microprocessor-based computers that emphasise their small size and personal information management capabilities. Conventional PDAs utilise a single screen. The PDA screen surfaces are touch sensitive to permit input functions. One screen is usually provided, the small size of which results in a limited input and output-working surface. Multiple screens can increase the user's effective, or virtual, screen real estate.

Electronic books are known to provide multiple screens (U.S. Pat. No. 5,534,888 to Lebby et al., U.S. Pat. No. 5,467,102 to Kuno et al., and U.S. Pat. No. 5,239,665 to Tsuchiya). Multiple screens are known which can display a single virtual (or linked) image (Kuno). In U.S. Pat. No. 5,579,481 to Drerup, networked computers use a wireless stylus and standard CRT screens to enable files to be moved from one networked computer to the other through application of the stylus to the screen. The stylus has an identifier and when applied to screen A, the selected file is associated with the unique ID of the stylus. Later, if the stylus is applied to a second screen B, the computer for screen B recognizes the ID of the stylus, remembers the file associated with it and then retrieves the file through the network from the computer associated with screen A.

Note however, that this approach to maintaining continuity is not feasible for Personal Digital Assistants that have more than one touch screen.

As described in greater detail below, known input devices include touch screens, touchpads and digitizers. All use basically the same grid construction to sense the co-ordinates of the user's input through a pointing device, be it a stylus or fingertip.

Touch screen displays have been introduced and widely used due to their intuitive interface and low-cost. Computers with touch-screen displays regard the operator's fingers or a hand-held stylus as the pointing device that manipulates the display's surface.

Computers with multi-displays are known where the nature of the application requires greater screen real estate (e.g., CAD applications) or the ability to have multiple entry points (e.g., machine-code debuggers). Typically these computers use standard pointing devices like a mouse or a digitizer for input.

Standard pointing devices utilize a flat, continuous surface which software maps to the displays' real estate. Through software, the displays are mapped either to a single virtual desktop or to multiple desktops. The pointing device moves continuously through the entire virtual desktop.

Where multiple displays underlie a discontinuous -display surface, through the pointing device, users can drag, transfer and manipulate objects across the multiple displays because the pointing device itself never crosses a discontinuity in the input surface.

Computers with multi-displays that employ touch screen technology will have the displays' surfaces functioning as the 'pointing device surfaces'. There is a complexity in building intuitive user interfaces if the displays were mapped to a single virtual desktop and the user needs to

move and manipulate objects across the multiple displays. This complexity results from the fact that there is a physical discontinuity in the 'pointing device surfaces'.

Multiple screens, which are capable of displaying a single virtual image, and which also will allow touch-screen input, are not known to the applicants. This is further complicated in the situation where, in graphical user interfaces (GUI), it is common to select an object (e.g. an icon representing a file, a text or graphic clip, etc.) and drag it to a specific location on the screen (e.g. a "trashbin" icon for deleting the file). With a single, continuous screen, which doubles as an input surface, a user may easily identify or select the object by touching it with a pointing implement or device. Then in a continuous movement the user may drag the object across the surface of the display (maintaining contact between screen and the pointing device) and release the object once there for whatever purpose. However, as stated, with multiple screens, there is necessarily a physical discontinuity therebetween. Thus, one cannot maintain this continuous movement of the stylus without losing contact between the screen and stylus and accordingly lose the object when crossing the discontinuity.

## SUMMARY OF THE INVENTION

Apparatus and process are provided wherein an object can be manipulated between multiple discontinuous screens. Each screen is touch or input sensitive to a pointing implement or device, and a physical discontinuity separates each of the screens from the others, this discontinuity being non-touch sensitive.

Broadly, the process comprises:

- selecting a first object on a first source screen with the pointing device or stylus. Parameters defining the object are stored in an internal buffer so that it is removed or copied from the source screen, either by
  - i. starting a timer upon selecting the first object, automatically storing the first object, or
  - ii. continuously touching the 'left' button of a wireless stylus; or by
  - iii. selecting an object "cut/copy" function through

- selection of a displayed second object through software, or through touching the screen in a specific operating system recognized gesture or through application of a hardware button; then
- moving the pointing implement across the discontinuity, from the source screen to the target screen; and then
- releasing the first object from the internal buffer so that the first object appears on the target screen either by
  - i. contacting the target screen with the stylus before the timer expires, reaching its pre-determined timeout; or
  - ii. when the 'left' button of the wireless stylus is released with the stylus touching the target screen; or
  - iii. placing the stylus in contact with the target screen and an selecting an object "paste" either by selecting a displayed third object, through touching the screen in a specific 'operating system recognized gesture', or clicking the wireless stylus' right button and choosing 'paste' from the context menu that appears).

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of PDA having two touch-screens opened and having a discontinuity (hinge) therebetween;

FIG. 2 is a diagrammatic view of the PDA according to FIG. 1, showing two screens displaying a single virtual desktop and a pointing device or stylus dragging an triangular object across the intermediate discontinuity, this action being impossible without the process disclosed herein,